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RECENT ADVANCES  
IN THE  
TREATMENT OF PULMONARY CONSUMPTION.

A Paper read before the Medical Society of the State of Pennsylvania,  
at Bedford Springs, Pa., June 30th, 1887.

BY

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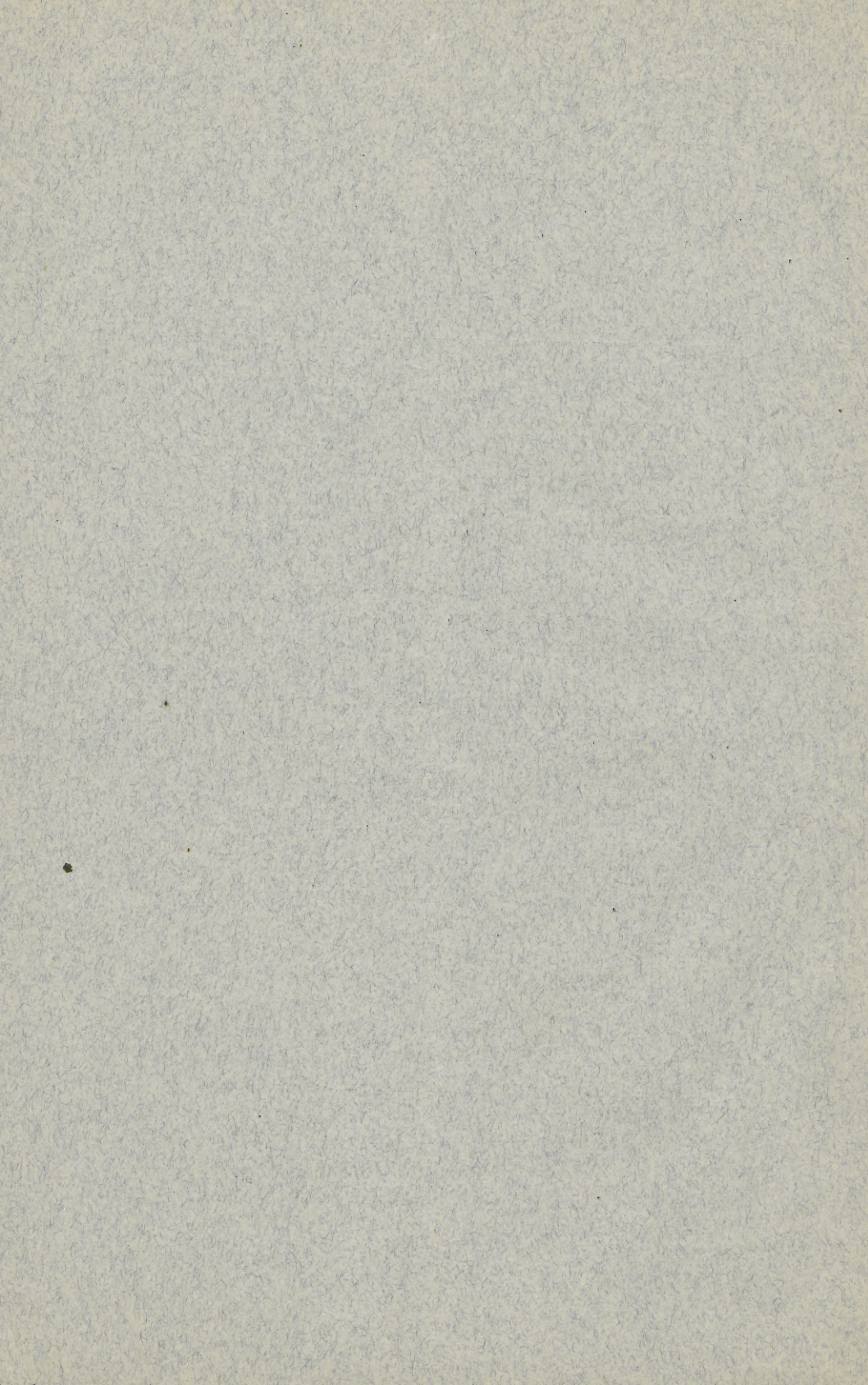
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## RECENT ADVANCES IN THE TREATMENT OF PULMONARY CONSUMPTION.

BY SOLOMON SOLIS-COHEN, A. M., M. D.,

PHILADELPHIA.

“When a physician has not a great deal to do,” once said the distinguished Professor of Practice at my Alma Mater, “he writes an essay on Consumption—and when he has nothing at all to do, he writes a book on that topic.” I plead guilty to several essays, but I have not yet written the book. Yet I feel that it is not waste of time for the members of this Society to give thought, and to exchange views, upon the management of a disease so widespread and attended with a mortality so great—a mortality, however, that can be and ought to be lessened; and it is with the object of eliciting a discussion, wherefrom both we and our patients may derive benefit, that I venture to submit in the sketchy outline and with the practical tendency alone permitted by necessary brevity, a personal estimate of the value of some of the more recent methods employed in the therapeutics of phthisis. It may be that many of these so-called new measures are but revivals and modifications of old ones. Some of them have, I know, been employed for a long time by a few practitioners both here and abroad; but in the sense that their more general recognition and adoption is of comparatively recent date, they may be termed modern methods. By the use of the measures to be described, and similar ones—for I cannot pretend to describe in a brief paper all the expedients to which we may resort to accomplish the one end—I firmly believe, the mortality of phthisis may be vastly lessened; and many incurable cases be made to enjoy a more comfortable and greatly prolonged existence. It is well to relieve, even when we cannot cure. The briefest addition to an existence hopelessly doomed, may be of the highest moment to a dependent family. Therefore would I deprecate the endorsement by this Society of that unscientific and unsympathetic spirit, which indiscriminately condemns all efforts at treatment which cannot promise infallible cure. Yet even cure may be effected in many instances, the number of



which increases as our knowledge increases; and the likelihood of this result in any particular instance, is the greater, the earlier the case comes under intelligent and hopeful care. But whether our efforts are directed towards cure, that is, towards putting our patients in a condition that permits them to recover; or whether we aim at the prevention which is better than cure, excluding from consideration measures purely palliative, the objective therapeutic point may be summed up in one word—nutrition. Let us repeat the word and emphasize it—Nutrition. Like the orator of old, who defined the three essentials of eloquence as action, action, and action—the therapist of to-day defines the essentials of the management of consumption, as Nutrition, Nutrition, and Nutrition.

Of the measures intended to promote nutrition to which attention will be called in this paper, first in order, as I believe it to be first in importance, comes the subject of superalimentation, to which the prominent attention it deserves was directed by Debove's communications upon Forced Feeding, or Gavage, in 1881 and 1882. Debove being convinced that many consumptive patients, despite loss of appetite, maintained comparatively good powers of digestion and assimilation, determined to resort to mechanical feeding. He therefore passed into the stomach, through the mouth, a flexible rubber tube connected with a funnel (such a tube as had been employed for lavage—washing out the stomach—and the method of introducing which will be described in the latter connection), and by this means introduced much larger quantities of food than the patients would voluntarily swallow. The taste of the aliment thus administered becomes a matter of no consequence, and we are therefore able to select that which will give the most nutriment in the smallest bulk. Meat powders were adopted as the basis of Debove's nutritive mixtures, but milk, eggs, soup and farinaceous powders may be used either separately or in conjunction therewith. When necessary, pepsin, pancreatin, hydrochloric acid, etc., may be added, or peptonized aliments be employed. A mixture that was used with advantage by Dr. Stern, of Philadelphia, and myself, in the cases of two patients treated at the Philadelphia Polyclinic, consists of a quart of milk, two tablespoonfuls of beef powder, three eggs, fifteen grains of scale pepsin, and thirty drops of dilute hydrochloric acid, warmed and administered twice a day; the patient eating what he wished in the interval. In hospital service forced feeding is practiced three



times daily. In private practice we have to content ourselves with the possible. Meat powders may be purchased in the shops, or can be prepared at home by cutting boiled meat into little pieces, drying thoroughly by means of a water bath, and grinding in a coffee mill. Powder so prepared is said by Dujardin-Beaumetz to answer its purpose very well. The farinaceous powders used in France are prepared from cooked lentils, malted lentils, and maize. I have no personal experience with them, but they are said to be highly nutritious. About seven ounces of the alimentary powder, whether meat or farina or both, is mixed with a quart of milk or water, or milk and water, the milk being added slowly to form a paste, which afterwards dissolves readily in the additional liquid. When the long tube of Debove cannot be passed, or when patients will not allow it to be passed, it often suffices simply to pass the entrance of the œsophagus with a shorter tube, as recommended by Stoerk, or to make use of the special apparatus of Dujardin-Beaumetz, or Bryson Delavan, which consist of a glass jar with two tubes, one of which above the level of the fluid, communicates with a hand-bulb for supplying compressed air, the other below the level of the fluid, communicating with a short œsophageal sound of small calibre; an ordinary rubber catheter will answer at a pinch. When the bulb is compressed, the fluid food is driven over. Efforts of swallowing on the part of the patient will facilitate the process. From the reports made by reliable observers in France and elsewhere, as well as from a few cases under my personal observation, I feel no hesitancy in affirming that remarkable gains in weight may be obtained from forced feeding, and that very often there will be concomitant recession in febrile and other phthisical phenomena. Improvement in physical condition of the lungs has been reported, but I have never succeeded in keeping a patient under the treatment long enough to verify this by personal observation. American patients in private or dispensary practice are not as tractable as foreign ones in these matters, and I have had no opportunity of conducting the treatment of phthisis in hospital wards. To secure the benefits of superalimentation with the great run of patients, I have had to employ alimentary mixtures similar to those of the gavage process, by natural methods.

The general dietary advised is a largely nitrogenous one, of which beef, raw or rare, broiled or roast, forms the principal item; there being added sufficient milk, eggs, fish, lamb, mutton, poultry, leguminous

vegetables and greens, fruits in season, large quantities of butter, with small quantities of bread, potatoes and starchy foods in general. Alcohol is employed as a food when it is necessary to obtain force with the least expenditure of digestive energy.

Fried foods of all kinds, pastry and other indigestible matters are of course prohibited. Patients are advised not to allow more than three hours to pass without taking food, except during sleep, to drink a glassful of cream or milk, or cream punch, milk punch or egg-nog, just before going to bed, and to have milk at hand to drink in case of waking during the night or early morning. Not more than three set meals daily are advised, but in the intervals milk with or without alcohol, chicken soup, bouillon, rich broths, etc., are administered as a vehicle usually, for the beef-peptonoids of a well-known firm of American manufacturing chemists. Of this preparation it is endeavored to give not less than two ounces daily, and the amount may be increased as circumstances require. Various preparations of meat-juice, purchased in the shops or prepared at home, may be used in the same manner, according to indications. The aim of the treatment is to supply enough nutriment not alone to counter-balance current waste, but to make up previous excess of waste over repair, and the details must be elaborated in each case with special regard to individual condition. Cod-liver oil, we well know, is an advantageous addition to the dietary in some cases, but not in so many as we have supposed. At least it is not indispensable. Oleaginous inunctions are often of considerable benefit.

When over-feeding by natural methods fails, or when the patient is unwilling or unable to swallow the necessary quantity and quality of food, resort should be had without hesitation to the œsophageal tube and forced feeding.

But having supplied the proper kind and amount of aliment, we must place our patient in condition to digest and assimilate it. It is true, as already suggested, that we may make use in certain measure of predigested foods, and that we may assist digestion in other instances by the administration of the digestive ferments; but our endeavors must not cease there.

The problem before us naturally divides itself into three parts: First, the preparation of the digestive tract, to elaborate and to absorb the chylous fluids—primary assimilation; Second, the promotion of the complex process of the breaking down and displacement



of imperfect tissues and effete products, and replacement by new and vigorous tissues, with evolution of forces required in the economy ; *i. e.* metabolism, secondary assimilation ; and Third, the promotion of the excretion of waste products. The first desideratum is endeavored to be secured by methods which cleanse, disinfect and stimulate the digestive canal, varied in detail according to circumstances. When we have reason to suppose, for example, that a sluggish gastric catarrh interferes with digestion, washing out the stomach may be practised with good effect. The procedure is quite simple. A stomach tube of similar material to French catheter tubing, about 28 inches long, and  $\frac{1}{4}$  inch to  $\frac{3}{8}$  inch in diameter, is attached, by a short section of glass tubing, to a soft rubber tube about one yard long, in the extremity of which is inserted a hard rubber funnel of about 6 oz. capacity. The stomach-tube having been dipped into warm water or warm milk, is introduced into the œsophagus and propelled into the stomach by successive pushes, or swallowed by the patient ; and the funnel being sufficiently elevated, from a pint to a quart or more of warm water (say 100° F.), in which is dissolved a drachm or two of borax, table salt or baking soda, is slowly poured into the funnel. As the last of the fluid is passing out of the funnel, the latter is rapidly inverted over a receptacle on the floor, and the contents of the stomach are thus siphoned out. The manœuvre is repeated until the returned water is clear. This process, called lavage, which as already stated suggested gavage, and is practised in much the same manner, leaves the gastric mucous membrane in excellent condition for digestion and absorption. It may be immediately followed by gavage, as recommended by Dujardin-Beaumetz. The drinking of half a pint to a pint of hot water, half an hour to an hour before meal time, will sometimes accomplish much the same purpose, and is of course less troublesome.

When a condition of septic fermentation is believed to interfere with digestion, a suitable antiseptic agent such as carbon-disulphide water or solution of hydrogen dioxide, may be introduced into the lavage solution, and a portion allowed to remain a few moments in the stomach ; or creasote, carbolic acid, iodoform, the solutions mentioned, or other agents, may be administered in the ordinary way. When the intestinal canal is believed to be the seat of the trouble, we may attempt to wash it, indirectly, by lavage, or by potations of hot water, or to medicate it with creasote, bismuth, sulpho-carbolates, mercurials,

iodoform, sulphides, naphthalin, or other appropriate drug. I have reason to believe from the effect produced upon some cases of phthisis attended with diarrhoea, that the injection per rectum of hydrogen sulphide, directly or indirectly arrests septic fermentations in the small intestine.

To aid digestion, stimulate digestive secretion and promote absorption, in addition to the measures already referred to, preparations of malt, Hoffman's anodyne, bitter tonics, nux vomica, arsenic, (preferably Fowler's solution), iron, nitro-hydrochloric, nitric and phosphoric acids, trinitrin, and other appropriate medication, may be employed when indicated.

Nutrient being administered, digested and absorbed into the blood, must be converted into vital forces, and into tissue. Exercise and respiration are the natural means to effect this. "Respiration," said Arbuthnot, "is the second digestion." A proper respiratory diet is as important as a proper alimentary diet.

When the patient is able to carry out instructions, and when there is a sufficiency of unimpaired lung tissue, respiratory gymnastics and voluntary forced respiration may suffice to introduce the requisite atmospheric pabulum, and to propel the current of blood into the apices and other unirrigated regions. Ordinarily however, these measures will not be efficient, and must be replaced or supplemented by a method which affords mechanical assistance to respiration, independent of voluntary exertion. This method offers itself in the inhalation of compressed air, a subject which will always be connected with the name of Waldenburg. The air is inspired under an excess pressure gradually increased from  $\frac{1}{80} - \frac{1}{60}$  up to  $\frac{1}{40} - \frac{1}{30}$  of an atmosphere. Expiration is made into the atmosphere, or in some instances into rarefied air. The inhalations are administered once or twice daily. At each period, from ten to twenty-five, up to one hundred or more, respiratory acts are completed in five to ten minutes, and the process is repeated after an interval of about ten minutes. The value of this procedure as an aid to nutrition, formed the theme of the paper I read before this Society, last summer, and needs not now be elaborated. Let me, however, briefly recapitulate the principal points.

The inhalation of compressed air, dilating the air cells as it does by gentle and equable pressure, aids nutrition by securing the proper exposure of venous blood to the atmosphere, facilitating the disengagement of carbon dioxide and the taking up of oxygen to



be carried by the hæmoglobin to the tissues and assist in force-production and tissue change. The mechanism by which this is accomplished is complex. The air passages are cleansed from decomposing products of secretion and desquamation, and the alveoli are reopened in unused, blocked and partially consolidated areas of pulmonary tissue ; thus securing efficient pulmonary ventilation. Increase of partial pressure, favors dissociation of carbon dioxide and association of oxygen in the pulmonary capillaries. Direct pressure and pressure differentiation, tend to promote the relief of congestion in the lungs, the absorption of inflammatory congeries of new cells, and the stimulation of both intra-pulmonary and peripheral circulation. Increase of blood pressure, further, stimulates the production of lymph. Thus is secured not alone the exposure by increased volume and rapidity of pulmonary circulation, of a greater number of corpuscular oxygen carriers to the increased volume and weight of inspired oxygen, under the conditions most favorable to oxidation of hæmoglobin ; but also the penetration of the corpuscles with their vitalizing burden in the nutrient lymph-stream, further into the tissues. This latter effect may theoretically be heightened, by a measure advocated by Prof. Bartholow in simple anæmia with sluggish peripheral circulation ; namely, dilatation of the terminal vessels by means of trinitrin (nitro-glycerin.) I have as yet no available experience with nitro-glycerin in phthisis.

Circumstances which had long militated against the popularization of pneumatic treatment among the profession, were the cost and the cumbersome clumsiness of the necessary apparatus, and the time, which busy men can ill spare, required for the procedures. In 1883, with the assistance of Mr. Chas. Richardson, of the house of Queen & Co. of Philadelphia, I succeeded in largely obviating these objections by means of the apparatus before you, which can not only be employed in the physician's office, but may be entrusted to the management of the patient or his friends at home ; and is comparatively inexpensive. It is fully as efficient as the apparatus of Waldenburg, upon which it is modeled, and like its original, is superior to a certain widely advertised and extravagantly costly patented instrument, devised in 1885. It consists simply of a small gasometer and a foot-bellows. The inner cylinder, or air chamber of the gasometer, is weighted at bottom, in order to throw its centre of gravity as low as possible, and preserve its steadiness without pulley or flanges.



Air is pumped in by means of the foot-bellows, the supply valve of the latter being connected with a rubber tube of large aperture, which is placed out of the window, to secure pure, fresh air. Without additional weighting, the inner cylinder gives a pressure of  $\frac{7}{8}$  of an atmosphere. By placing additional weights on top, the pressure may be increased to any desired amount up to  $\frac{7}{8}$  of an atmosphere. The supply of air is continuous, and the patient may inhale directly from the apparatus, or the stream of inspired air may be made to pass, as I show here, through a Wolff bottle containing terebene or other volatile medicament. The mouth and nose are covered with a mask to exclude atmospheric air, and the ingress and egress of respired air are regulated by a stop-cock. For detailed information as to the use of compressed and rarefied air, time requires me to refer to my previous communications, or to the text-books on Inhalation.

To the administration of compressed air inhalations twice a day, is to be added, when possible, due exercise in the open air, and when this is not advisable or possible, passive exercise by massage, frictions and similar measures. Three hours after meals, during the culmination of digestion and the activity of absorption, is the preferable time for open air exercise. In the presence of active febrile process, both active and passive exercise are to be moderated or even interdicted. Compressed air inhalations however need not be abandoned. Inhalations of nitrogen have been recommended to abate fever. I have not tried the measure.

Digestion, absorption and metabolism being assisted, it remains to promote depuration and excretion of waste, in order to rid the system of the now well recognized danger of auto-intoxication by leucomaines, ptomaines, etc., and to make room for reconstructive materials. Stimulation of the emunctories by diuretics, cholagogues, cathartics, even diaphoretics, is here indicated; but drugs should be avoided as far as possible, and when absolutely indicated only the mildest remedies are to be chosen, these being promptly discontinued when the desired effect has been produced. Our general tonic medication, exercise, forced respiration, etc., will of course assist directly and indirectly, as emunctorial stimulants. The daily sponge bath, which to the well was a matter of comfort and cleanliness, becomes to the consumptive a measure of therapeutics. The drinking of water, preferably hot, is again applicable as the best of diuretics and a potent diaphoretic. Lemon juice and sugar may be added to render it more palatable,



the former indeed increasing its value as a diuretic. Nitro-hydrochloric acid is among the best hepatic stimulants in this connection. An enema is ordinarily the best method of emptying the bowels. To overcome intestinal torpor, the same measures employed under other circumstances, *nux vomica*, *belladonna*, *faradism*, etc., may be resorted to. Among the preferable cholagogue cathartics are *podophyllin* and *rhubarb*.

The indications thus far considered may be fulfilled in the generality of cases by the following routine:

1. An abundant and proper diet, as already discussed. Gavage if necessary.

2. The drinking of hot water, or hot lemonade. Lavage if necessary.

3. Moderate open-air exercise, respiratory gymnastics, daily inhalations of compressed air.

4. The administration of some such pill as this, three or four times a day; iodoform, one or two grains, creasote  $\frac{1}{2}$  minim to one minim; to which may sometimes be added reduced iron, one grain, or arsenious acid  $\frac{1}{60}$  to  $\frac{1}{30}$  grain; the pill being made up with glucose, crude petroleum or extract of licorice, with the addition, if indicated, of some bitter extract, such as *gentian*, *cinchona* or *nux vomica*, and dispensed in capsule. Among other useful prescriptions may be cited, when iron is indicated, compound syrup of the phosphate of iron (Parrish), tincture of chloride of iron, dilute phosphoric acid and Churchill's syrup of hypophosphites (J. Solis-Cohen), the official syrup of hypophosphites and iron, syrup of iodide of iron, etc. Iron seems to be better borne by the stomach, and to be more readily appropriated by the red blood globules when inhalation of compressed air is practised. I have noticed this even in non-phthisical anæmia. Cardiac weakness, excessive febrile action, and other conditions, may call for appropriate medication.

Although the ordinary administration of drugs is beyond the limits proposed to be discussed in this paper, it may be interpolated while upon the subject of internal medication, that great improvement is in many cases apparently due to the use of iodoform, both singly and in combination, in doses ranging from one to five grains, three times daily. Gains in weight are often very gratifying, when sufficient food is furnished. Thus I recall a patient under my care in the Medical Clinic of Jefferson College Hospital, who although far



gone in the disease and doubtless beyond the possibility of permanent restoration, gained eleven pounds in one month, while taking a pill of iodoform, two grains, three times a day, and drinking from one to two quarts of milk daily, with the addition of beef-peptonoids. Crude petroleum, like creasote and tar products in general, seems to have a favorable influence upon cough and expectoration. The good effects of iron and arsenic in anæmia and malnutrition generally, are well known. Their action in phthisis needs no other explanation. It is due primarily, I believe, to direct influence upon digestion; secondarily, to general stimulation of constructive metamorphosis.

Thus far we have considered in the main, measures directed to the general system. To the inhalation of compressed air, a measure in part designed mechanically to counteract local pathological conditions, and to the administration of iodoform and creasote, drugs devoted in part to the restriction of morbid histological action, we may add some of the newer devices immediately directed against the local morbid processes, in part or in whole.

First, in this division of our theme, is the subject of medicinal inhalations. This might well be made the subject of an elaborate paper. Time permits but a hasty indication of its value. The general profession has been unaccountably slow to realize the advantages of a method which permits of direct medication of the respiratory tract, in greater or less extent. This hesitation may have been due in part, to the extravagant claims made by some unbalanced observers. I will try to avoid that error, though I cannot help speaking with enthusiasm.

There are certain volatile medicaments long known to exert favorable influence upon pulmonary diseases, although the method of their action is a matter of dispute. From a purely empirical standpoint, then, I will enumerate in the order of merit, those that appear to me to be the most generally useful. These are creasote, ethyl iodide, terebene, oil of turpentine, tincture of benzoin, spirits of thymol, and spirits of chloroform. Eucalyptol is often useful, but in the main has disappointed me. Whatever the reason may be that the atmosphere of pine woods benefits those suffering with chest troubles, is the reason that terebinthinate inhalations at home have sometimes an almost equally good effect; especially so, it seems, if combined with oxygen. Ethyl iodide, besides some specific effect of its own, offers a ready means of local and general iodization without disturb



ing the stomach. To preserve it, it should be mixed with alcohol and dispensed in a dark bottle.

In chronic processes, creasote, terebene and ethyl iodide, are employed for general good effect. To control subacute epiphenomena, terebene and ethyl iodide are most frequently resorted to. Benzoin is preferred for acute catarrhal processes. Thymol is sometimes substituted for creasote when the odor is a source of complaint. Chloroform finds indications as a sedative to troublesome cough, and as a mitigant of the sharpness of some specimens of terebene. Burroughs and Welcome's terebene is to be preferred for internal use, but the commercial terebene (Muerck's?) seems better for inhalation, and very often requires the admixture of chloroform or spirits of chloroform. These agents may be inhaled from a wide mouthed vial; but preferably from the sponge attached to the little perforated zinc respirator, devised by Dr. Burney Yeo, of London; which may be worn almost continuously with very little inconvenience, thus keeping up a desirable effect. Many patients wear the respirator during sleep and are perfectly comfortable. Fifteen to twenty drops of a mixture consisting, for example, of equal parts of creasote, terebene or ethyl iodide, and spirits of chloroform or alcohol, may be dropped on the sponge, and renewed two or three times a day. One of the volatile substances enumerated may be floated on the surface of water in a Wolff bottle connected with the compressed air apparatus, or with a reservoir of oxygen. Terebene is the one usually chosen for this purpose. Vaporous sprays of various antiseptic, stimulant, or sedative solutions may be administered by means of the Oliver or globe vaporizer, or one of the many contrivances depending upon the same principle—a combination that is, of the Bergsson and Sales-Giron methods of nebulization; giving a very fine mist which apparently penetrates the air passages for some distance. Messrs. Codman & Shurtleff have, at the suggestion of Dr. J. Solis-Cohen and myself, arranged a neat combination of the Oliver vaporizer with the stop-cock of a compressed air apparatus. Should this device stand the test of experience, I will describe it in a future paper. Hydrogen dioxide suggests itself as a valuable drug for use in this manner.

Acting upon a suggestion of Professor Bartholow's, I am making some observations on the inhalation of sulphurous acid gas—an old remedy—by a new method. It has been found that carbon dioxide

and sulphur dioxide, both extremely rebellious gases when attempt is made to liquefy them separately, may by a comparatively slight pressure, be together brought into a liquid form and confined in an ordinary mineral water syphon bottle. On releasing the pressure, they immediately return to the gaseous state, and the air of an apartment may thus be readily charged with any desired quantity. The diffusion and probably the mixture with carbonic acid, robs the sulphurous acid to some extent, of the suffocating properties it exhibits when inhaled undiluted. The dose is to be regulated in each case by the individual capacity to breathe the sulphurous atmosphere—which varies greatly—and the patient is to pass as much time as may be practicable in the medicated apartment. Sufficient time has not elapsed since I have been able to obtain the liquid referred to, to venture a positive expression of opinion from my individual experience. I believe that it will prove to be a valuable addition to our resources.

This leads naturally to the subject of rectal injections of carbonic acid and hydrogen sulphide. At the time that I had announced the sub-titles of this paper, the Bergeon method of treating phthisis was a novelty in this country; but as the members of this Society are now beyond doubt thoroughly familiar with it, I shall, instead of describing the process in full, simply give a few practical points, the result of personal experience: first, as to the method of preparing and using the gases, and secondly, as to what may and what may not be expected of it.

The intelligent physician will “prove all things and hold fast to that which is good;” even though imperfect experience may decry as utterly useless that for which unbalanced enthusiasm has claimed too much. He will not hold scientific investigators to account, for the vagaries of irresponsible newspaper reporters; nor reject that which palliates, because it does not infallibly cure. In the first place, we must remember that the effect of the Bergeon injections is produced by the elimination of the hydrogen sulphide (or other active agent) through the air tract. Unless we obtain evidence of this elimination by recognition of the odor in the expired air, or the blackening of test paper of plumbic acetate (in case H S be employed) by the breath, we are not securing the proper effects, and cannot expect improvement. Failing to secure this evidence in many cases, with most of the natural waters used, I have been well satisfied by the use of the solution recommended by Yeo after Bardet, which is pre-



pared by adding to 8 fluid ounces of water, three fluid drachms each, of the following solutions:

No. 1.	Sodium sulphide, c. p. <i>recent.</i> . . . . .	℥ss.
	Distilled water . . . . .	f℥vi. M.
No. 2.	Tartaric acid . . . . .	℥i ℥ij.
	Salicylic acid . . . . .	℥ss.
	Distilled water . . . . .	f℥vi. M.

Secondly, To avoid colic and griping pains, we must be sure no air remains in bag, bottles, tubes, or any part of the apparatus, and must warm the injected gases.

Thirdly, Twenty minutes to half an hour must be consumed in the process. From four to six quarts of carbon dioxide should be used at each injection, after the first few to establish tolerance. The patient should remain recumbent for half-an-hour after the cessation of the injection.

Fourthly, The best times for injection are just before breakfast, and just before going to bed, i. e. three hours after supper.

Fifthly, Patience and perseverance are necessary both on the part of patient and physician.

Sixthly, Tartaric acid is more easily carried and more neatly handled than sulphuric acid, and will disengage carbonic acid from sodium bicarbonate as quickly. About two parts by measure of tartaric acid to three of sodium bicarbonate, is a good working rule.

This method of treatment is not designed to destroy the bacillus tuberculosis, but to remedy those local conditions, mainly suppurative, which permit that microbe to find a suitable habitat in the lungs. A significant fact recently reported, and if verified, of vast scientific importance in correcting current errors as to etiology, is that sputum from patients thus treated, fails to produce tuberculosis in animals.

The effects of the treatment, as I have seen them, not in all cases, but in many, are more or less rapid reduction in temperature, diminution of cough, improvement in the character of expectorated matters, promotion of sleep, increase of appetite, cessation of night-sweats. These palliative results, great in themselves, are still greater in the removal of obstacles to nutrition. The physical signs attributable to collateral catarrhal and suppurative processes subside. I have seen no cure; but then there has not been time either to permit recovery, or to test its reality. I have not noticed any marked recession in physical signs in the lung due to the tubercul-

ous process itself, but in two cases,\* patients of Dr. J. Solis Cohen's, I have seen cicatrization of laryngeal ulcerations apparently tuberculous, and so diagnosticated by the competent observer mentioned, with subsidence of pyriform tumefactions. This is a rare occurrence, even with assiduous local treatment, and in these instances no local treatment was instituted.

In no case, however, have we abandoned superalimentation, or refrained from medication when it seemed to be indicated. I regard the Bergeon process as a good adjuvant to other treatment, but until I have larger and longer experience therewith, I should hesitate to place sole dependence upon it. To establish its proper value, we must employ it in all cases, and find out in what group it seems to be most useful. I should say from my own experience, and from what I learn from my friends in Philadelphia, that the cases in which it appears to be efficacious are neither those where the lung is hopelessly broken down, and it is powerless; nor those in which softening has not begun, and it is unnecessary; but those in which septicæmic processes due to pulmonary suppuration are a source of danger and a cause of depression; yet in which there is still a hope of prolonging life, if the suppurative process can be controlled. When this has been accomplished I should then feel disposed to resort to inhalations of compressed air. Inhalations of compressed air are indeed the one great dependence in cases of early phthisis, and were I compelled to choose between such inhalations and all the drugs of the pharmacopœia, I should unhesitatingly prefer the former. I know that I have seen consumption cured by this means. I have seen cases in the practice of my brother, that have remained well for ten years, and know of some still living that have survived the predicted time of death even longer; and I am happy to say in conclusion that the patients of my own, whose cases I reported to this Society last year, are still alive, and to all appearances perfectly well. The treatment adopted in these cases, and carried out at home—obviating the expensive and often futile quest after a health restoring climate—was superalimentation; compressed air, ethyl iodide and terebene inhalations; iodoform, creasote and iron internally—measures directed not against a microbe which is the evidence of disease, but against the malnutrition which is its cause.

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\* One of these patients (to whom an unfavorable prognosis had from the first been given) deeming himself well, ceased treatment in July, and notice of his death was seen in the papers, in October. The other is apparently well [Oct. 11, 1887].













